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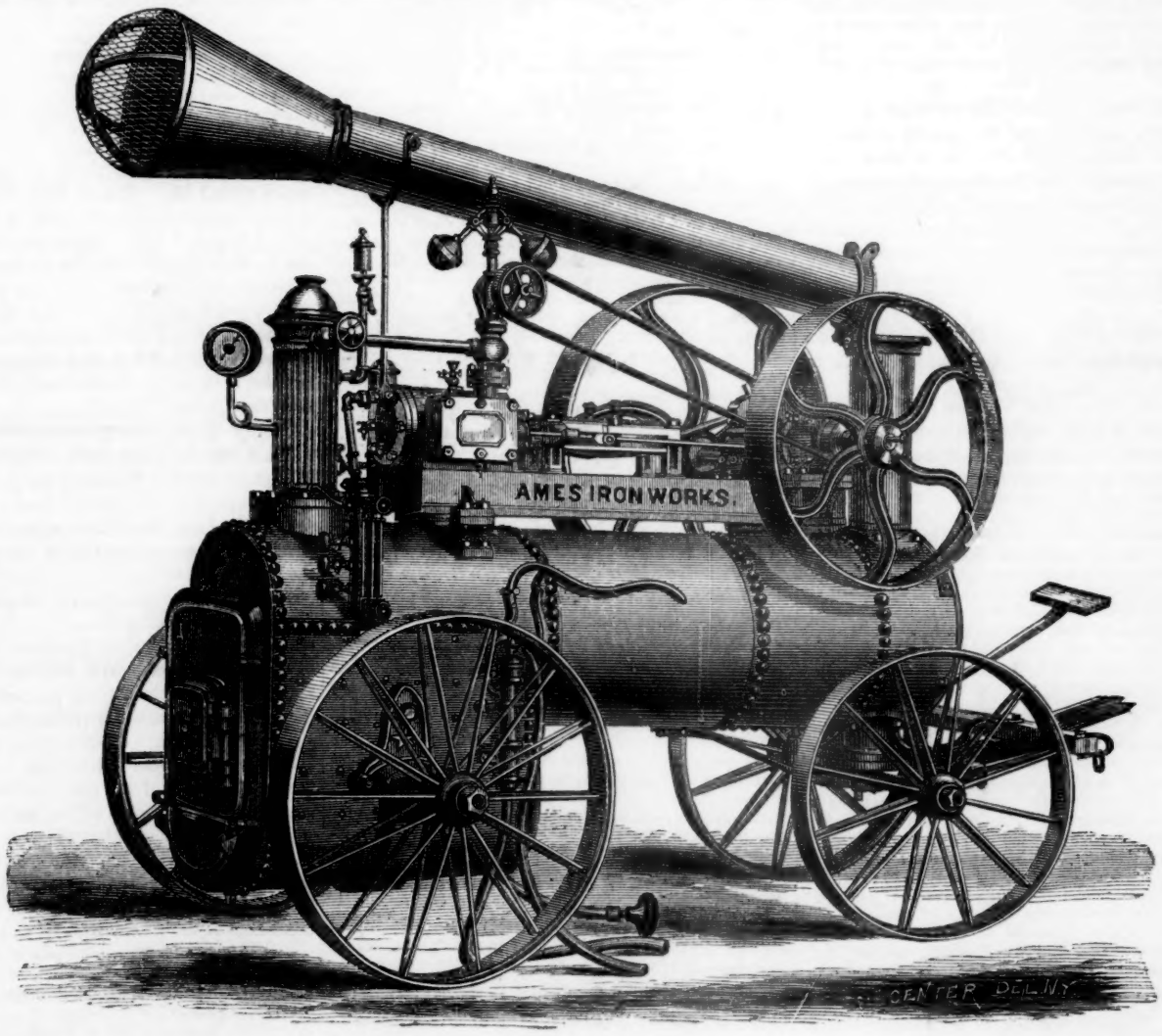

Agricultural Engine.

These engines, for farm purposes, are constructed on very strong trucks or running gear. The bolster being placed under the end remote from the furnace, so that the bulk of the weight is placed upon the hind wheels of the truck; the axles of which are made from the very best refined hammered iron, while the hind axle is curved to the exact shape of the boiler at the fire box end which gives an equal bearing to the parts attached; this not only gives extra strength, but prevents any local strain on the bearings or axle boxes. The boxes are of our own manufacture, from new designs, and will be found suitable for the purpose. Brackets or "clips" are also bolted to the boiler, which are constructed to abut the shoulders of the axles, thus firmly bracing them against the effect of sudden trial or shock.

A Saltar Spring Balance is used on the safety valve, instead of a weight.

The smoke pipe is hinged, and provided with a spark arrester.

The engine is also provided with a flexible suction pipe, with rose strainer, an extra force pump for supplying the boiler while at rest, and a comfortable seat for the driver. There is also an extra band or driving pulley of large diameter, viz., 50 by 7½ inches face, suitable for driving the separator at the proper speed.

In fact, nothing has been omitted in the construction of these machines and appendages, that is useful and efficient in developing them as the best and most powerful agricultural engine now in the market, and one of the most efficient labor saving appliances for farm purposes the present age affords.

Further information can be obtained on applying to Edward P. Hampson, 38 Cortlandt street, N. Y.

Gas Works for Whooping-Cough.—The Indianapolis *News* of a late date says: For the past two or three weeks an average per day of forty or fifty persons having the whooping-cough visit the purifying-room of the gas work. It is claimed that a cure is effected by the person coming five or six times, and remaining ten or fifteen minutes each time. Relief is felt usually within a day.

Chemical Repertory,
No. 61.—December 16, 1871.
EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

121. HEAT FROM MENTAL (?) ACTION.-Dr. Lombard (*New York Medical Journal*, June, 1867) demonstrated by experiment the close connection between mental power and its physical manifestation. He used the thermo-electric pile of Melloni, with a galvanometer of extreme delicacy, by which the minutest fraction of a thermometric degree may be indicated. Having ascertained that the most sensitive part of the skull for revealing a change of temperature is that portion immediately above the occipital bone, he fastened a pair of bars to that part of the head, and to counteract the effect of a rise of temperature of the whole body, another pair, reversed, was connected with the leg and arm. After repeated efforts a state of perfect quiescence and repose in the person undergoing the experiment was attained, and the needle of the galvanometer remained stationary. But when an audible sound was made, or a knock at the door was heard, the needle swung through 20°. The mere passive reception of the sound—the consciousness that sound had been broken—eliminated heat, which was indicated by the needle. These experiments establish a close connection between the mental powers and the physical forces, and open up a host of questions which as yet can be but imperfectly answered.—*Am. Exch. and Review.*

[Above all, it appears to us that this class of experiments is liable to lead to rash conclusions on the part of superficial reasoners. What is there after all, in this more wonderful than (or even as wonderful as) the effect of some sudnen mental emotions, as in a *blush*, for example, the temperature and chemical status of the whole body? The heat in case above is most probably not a direct, but a secondary effect of brain action.—ED.]

122. EXTRACT OF MEAT.—Dr. Mueller.—The following conclusions are drawn by the author from his researches, corroborated by those of a great many others, among these Liebig and Virchow: Meat extracts are neither directly nor indirectly food, for they do not contain albumenoid matte, neither do the nitrogenouss principles which they contain prevent the waste of the organic matter which composes the body. In small doses, these extracts are useful by the stimulant action of the potash salts, which promote digestion and circulation; in strong doses—too large quantity at once—these substances may have a very injurious effect. When given to convalescents from serious diseases, especially if the system is exhausted by prolonged abstinence, the potash salts present in these extracts in large quantity will act more injuriously because the system has lost a great deal of chloride of sodium; instead of then promoting the nutrition these substances will interfere with it: (1) by the direct action of the potassa salts on the blood globules, whereby the absorption of oxygen of these globules is greatly decreased; (2) by the predominance of such salts in the serum of the blood which only physically dissolve carbonic acid and do not allow the normal quantity of that gas to be exhaled, and thus impede the access of oxygen. Medical men should bear in mind that if given alone, these extracts, and the same applies to beef tea, are no nutriment, and only tend to keep the convalescents weak and not only ill fed but not at all fed.—*Moniteur Scientifique.*

123. IMPROVED LAMP.—W. Scarlett, Aurora, Ill., patented Nov. 14th, the following:

This improvement embraces a guide arranged in the body of the lamp adjacent to the filling-hole, and adapted to guide a float within the lamp. Also, a bright cap on the float, so mounted in the lamp as to be conspicuously seen in looking down into the filling-hole, and to warn when the filling is nearly completed. Also, a perforated cylinder in the hollow stock or shaft of the lamp, so arranged as to receive air freely below, and to discharge it gently into the space around, to be thence conducted upward through an annular space to the burner.

124. MANUFACTURE OF HYDROGEN GAS.—*Les Mondes* tells us that H. Giffard has tested at a Chemical Works in Paris, a plan working as follows:

Steam is passed over red hot iron. Two cubic meters (70 cubic feet) of hydrogen were evolved per minute. When oxidized, the iron is again reduced by a current of dry carbonic oxide (how obtainen, not explained) and used over again. Some such plan *may* do.

125. DETERMINATION OF MOISTURE IN BONE-BLACK.—Dr. Isidor Walz, in the *American Chemist*, details experiments that have led him to the following conclusions:

1. The moisture contained in Bone Black may be estimated by heating the latter one hour at a temperature of 250° F., or by leaving it 24 hours in the desiccator over sulphuric acid.

2, If Bone Black is exposed to a much higher temperature than 250° F., for a sufficient length of time, an increase of weight (probably caused by oxidation) takes place, and the amount of moisture will be found too low.

126. BUILDING MATERIALS.—Mr. Mullett, the Supervising Architect of the Washington Treasury Departmen, has again been *interviewed*. He now says:

"Cast iron, absurd as the statement may appear, will not resist as much heat as good sound oak timber of the same dimensions. Fire expands the iron and warps it and breaks it very easily. Indeed, if oak timber should be treated by any of the processes of liquid sillicate, it may be considered almost a fire-proof material compared with cast iron. As for stones suitable for building purposes, as I told you before, there are few that are fire-proof, though some approximate the necessary conditions, and, except in severe conflagrations, may be generally depended upon. Granite, marble, and sandstone are not to be trusted, as they soon perish by exposure to the heat, as has been shown a thousand times. But I am strongly in favor of liquid silicate as a preparation for wood to be used for building purposes. My attention was directed to this material some years since, but I have not had an opportunity to investigate the subject fully. I believe, nowever, that it merits more attention than any other suggestion that has been made public, and may yet prove one of the most practical solutions of the question of non-combustible construction that has yet been offered. Whether this or some other process for making wood incombustible is the more desirable, I am not prepared to say. I am, however, decidedly of the opinion that any process by which wood can be rendered non-inflammable at a reasonable cost would not only be an inestimable blessing to the public, but its use should be rendered imperative by law."

[Which accords with our ideas, as recently reiterated in these columns. We, however, in addition to coatings of soluble glass and other materials, prefer to make a sure thing of it, by impregnating the whole wood with chloride of calcium or aluminum. We congratulate Mr. Mullett on the unusually advanced state of his ideas.—ED.]

127. THE MANUFACTURE AND THE PRESERVATION OF MEAT.—The system of ice manufacture devised by M. Tellier is based on the evaporation of pyroligneous ether. This ether is much more volatile than ordinary ether. At atmospheric pressure it volatilizes at 22° below zero. The action of the apparatus, as in the ammonia method, is based on the constant circulation of the same mass of ether, alternately vaporized by simple escape, and condensed by compression.

M. Tellier has an establishment in operation for making ice at Anteil. Among numerous other applications it has been applied by M. Tellier to the preservation of meat. In the latter he has been very successful.

During the siege of Paris he presented to the Academy of Sciences pieces of meat which had been preserved for fifteen months. The meat is placed in an iron receptacle which can be closed at the upper end; this is deposited in a wooden back, in which the freezing mixture is made to circulate. The air is then drawn out from the vessel, but as it is impossible to obtain a perfect vacuum, to draw the last traces of water from the meat, a current of carbonic acid is passed over it for some time. This is easy to absorb with a little lime, and an almost perfect vacuum is obtained.—*Am. Chemist.*

128. NAPHTHALIZATION.—A writer in the London *Mining Journal* introduces a suggestion worthy of preservation.

"Of the apparatus best entitled to general adoption, the carburiser invented by the Rev. W. B. Bowditch, of Wakefield, should be mentioned as the most philosophic. He recognised the fact that with the carburising liquids generally at disposal it was essential to keep them warm in order to ensure their vaporisation To this end he placed his burners beneath (at a fixed distance) his chambers containing the carburising fluid, and in some cases the arrangement worked admirably, but it was a mistake to make the distance uniform, because the uniformity of the liquid could not be relied upon, and hence the invention has fallen into disuse; but it is probable that had Mr. Bowditch provided for making the pipe below the chamber telescopic, all difficulty would have been overcome, as the heat reaching the bottom of the chamber could have been easily regulated and a good steady light obtained, regardless of the volatility of the liquid employed."

129. COAL AT PANAMA.—Some long accounts have appeared in various papers of large discoveries of good coal on the Isthmus of Panama by an English clergyman, who has obtained concessions there. Specimens of the coal have been tried at Panama, and favorably reported as equal to the best Cumberland steam coal of the United States. These newspapers selections are calculated to excite great expectations, the more particularly as it is stated the large consumption of Panama will be supplied from these mines. As yet no direct account has come home, bnt we find that the coal deposits on the isthmus are well known, and have been described long ago. They are extensively distributed, and there is supposed to be a large supply, but the opinion of competent parties has been that the formation is not a true coal, but a lignitic coal, like that of Lota, etc., in Chili. It is doubted whether it can compete with superior English coal put down in the West Indies. It is, however, to be observed that even an inferior coal in such a locality ought to be turned to account, as the Chili coal is, and that coal is now used to a very great extent for steaming, for copper smelting, and local factories along the coast, and is carried several hundred of miles, at least as far north as Copiapo.

130. COTTON SEED OIL.—The cotton seed oil factories around New Orleans have been compelled to suspend operations for the want of seed. The business, it is stated, has not been profitable. White refined cotton seed oil has been used principally to adulterate lard and sperm oils, and the large hog crop of 1870 put down the price so low that cotton seed oil was no longer in demand for purposes of adulteration. The value of the cotton seed cake used for cattle feed has also been largely diminished by the decline in corn and other grains.

Too Much Gas—Not Enough Light,

The various companies who furnish illuminating gas to the citizens of New York, appear to think that it is gas that we want, and not light. We have plenty of the former, at any rate we pay for enough, but somehow, in cold weather, the light becomes "small by degrees and beautifully less." If there ever was an absurdity, it is paying for gas by the cubic foot instead of by the volume of light it affords. What we want is light, and that is the article we ought to pay for, and the only correct measure is the photometer, not the gas meter. In every other country but this, there is an inspector appointed whose duty it is to report upon the candle power of the gas furnished by the companies; and, if it is found to be below the prescribed standard, the delinquent company is compelled to pay a heavy fine. In London the gas inspector is a thoroughly competent man, appointed by the government, and beyond the reach of the companies. He takes hold of the work fearlessly, and the consequence is that in this city the candle power of the gas is very much higher than with us. Some of the London companies take pride in keeping their gas up to fifteen candles, which is the maximum required of them. It is possible to make a gas of twenty-one candle power, but we could not consume it in an ordinary burner or under the usual pressure; it would be apt to smoke. The more dilute the gas is, the more readily it will pass through any given aperture; hence a gas of a very low specific gravity will rapidly run up a high score on the meter without affording any compensation in the amount of light.

If gas is to be sold by the cubic foot, then the company may pump in a quantity of atmospheric air, or let it consist of fifty per cent hydrogen, or make it of a low grade on purpose. As long as they contract to furnish gas and not light, they are at liberty to speculate as much as they please; the lapse is largely our own for not agreeing with them to give us light, and not gas.

Now that there is every prospect of a reform in many things, we propose that this question be also submit-

ted for discussion. All we want is to have a gas of a fixed and known candle power, to have an inspector appointed to control the manufacture, and heavy penalties attached for any breach of the law; precisely as it is in London, where the whole business has long since been reduced to a system, and frauds have rarely been detected. There are certain circumstances under which the companies ought to have some indulgence shown them, for example, sudden changes in the temperature cannot be anticipated, and they affect the illuminating power of the gas in a very marked ratio.

It has been found that the amount of light emitted at 32° Fahr., is 25 per cent less than at 65° Fahr., and at 4° above zero, it is 70 per cent. le s than at 65° Fahr. On the other hand, increased heat is not accompanied by a corresponding amount of light, since the temperature of boiling water causes an increase of 4 per cent. over the standard, and that of 320°, only 18 per cent. The loss of illuminating power is due to the condensation of hydrocarbons, which are gaseous at ordinary temperatures, but become solid in the cold. When the companies anticipate a cold snap, they manufacture a richer gas, which will bear this condensation without too great a loss in illuminating power.

The gas companies always have competent chemists, either directly in their employ, or retained for consultation; and they know how to furnish light with gas, instead of gas without light, as soon as it is made their interest to do so. As the law now stands, there would appear to be no remedy but to quietly submit, or take it out in grumbling; in the meantime, it would be well to revive the excellent bill drawn up last winter under the auspices of the Board of Health, and put on its passage as soon as the Legislature comes together. If that bill did not contain a proviso for the inspection of gas meters, it would be well to have it inserted, as the companies furnish their own meters, and the consumer cannot know that they give correct tally until he is so assured by the authorized inspector. It is a common observation at the present time, that persons who are compelled to work at night soon complain of weak eyes and defective vision.

Many students are disabled and obliged to abandon their studies, while others have substituted kerosene oil for gas. There is no doubt that poor gas has much influence in this increasing infirmity, and this fact affords another argument in favor of a change. According to the AMERICAN GAS-LIGHT JOURNAL, more than one hundred million cubic feet of gas is made every month in the city of New York. As the quality of coal used is manifestly very poor, the yield does not probably exceed six or seven thousand cubic feet; but even this inferior coal involves the distillation of about 17,000 tuns a month, or over 200,000 tuns a year. It is probable that, under proper legislation, the companies will be compelled to manufacture a gas practically worth one quarter more than they now furnish to consumers; and, as the annual amount paid to all of the gas companies in New York cannot vary very much from five million dollars, it follows that the community is at least one million dollars short in this transaction. It seems hardly credible that these figures can be correct, and yet they are based on the best information that we can obtain: They are so large that, even with a discount of 50 per cent., they show how imperative is the necessity for reform in a matter in which the whole population is interested. We repeat what we said in the outset, that we have too much gas and not enough light.—*Scientific American.*

Utilizing Coal Dust for Fuel.

The slack coal, or the fine waste from yard and mines, has long been regarded as a loss of great magnitude, and various have been the means employed to bring the waste material into practical use. Many modes of compression and admixture have been devised, to all of which so far, the application of a full practical test has developed objections. Recently we have had an opportunity of seeing the method employed by Emile F. Loiseau, which is new to us, and promises, from practical tests we have made, to withstand all objections that have hitherto been urged and maintained towards all other forms of artificial fuel. In a recent issue of the *Scientific American*, Mr. Loiseau thus gives some of the advantages of his discovery. We regret that our lack of space this month precludes the insertion of the entire article, the statistical references to European railroads and manufactures having proved of interest to ourselves, and doubtless would also to our readers.

"A great many attempts have been made to convert slack coal into a solid combustible. For this purpose, gum, coal tar, petroleum, asphaltum, rosin, solutions of glue, alkalies, silicates, magnesia, grahamite, and the remains of fabricated oil have been used, and the processes patented. These various experiments of solidifying anthracite slack have been failures. The high price of the ingredients used increased the expense so that it could not be applied to bituminous slack, in order to compete with the lump coal. Applied to anthracite slack, there was another difficulty. It has always been easy enough to solidify the slack, but to keep it solid in the fire till the coal is entirely consumed is something which has not been achieved yet.

Some inventors are still trying to solidify anthracite slack by means of coal tar, pine pitch, or rosin, giving the lump a heavy pressure, by using powerful machinery. In their opinion the more compact the lump the better it will stand fire. In my opinion, no matter what pressure is given to the lump, fire will penetrate it and consume the resinous substance before half the heating power of the coal has been obtained. The pitch or rosin being consumed, the lump will slack in the fire, and pass through the grates.

I have been for five years, from 1857 to 1862, commercial agent of one of the most important coal mines in Belgium, and have sold to Mr. Dehaynin the first two shiploads of slack coal for his factory at Montigny-sur-Sambre. I have seen him trying for three years to compress slack of hard coal with pitch and other substances, so that it would stand the fire, without succeeding.

In Belgium principally, and also in Germany, and in France, the working population in the coal regions, and the country people, are burning any kind of slack coal by mixing it with from 30 to 40 per cent. of yellow clay. It will be easily understood that such a large proportion of clay must reduce considerably the burning qualities of the coal Still, after a fire has been started with ordinary bituminous lump coal, they pile upon it, as high as they can, a pyramid of coal dust and clay mixed together, and simply molded and pressed by hand. The coal is used exclusively for open grates. They obtain at least a good fire, sometimes lasting the whole day without replenishing. The coal made in that way has to be sheltered, as rain and snow dissolve it.

This being a fact well known by everybody who has traveled in these countries, I have been working and experimenting for three years on that principle, always trying to increase the proportion of coal, and consequently reducing the proportion of clay. I succeeded so far, by a peculiar way of mixing and of working the mixture, as to reduce the proportion of clay to eight per cent. for bituminous slack. I invented a composition in which the coal is dipped, so that it becomes water-proof, and does not need to be sheltered. I have been manufacturing and selling that coal made from Suwanee slack coal, for the last four months, in Nashville, Tenn. The cost of manufacturing, including the ingredients used, has not exceeded one dollar per ton.

As I had never tried my process on the anthracite slack, I came to Philadelphia expressly for that purpose. The slack of the anthracite not being so coarse as the bituminous slack, I have been able to make the lumps compact with only five per cent. of clay. Samples of all sorts have been submitted to the Franklin Institute, who will report on it at the next meeting. These samples have been made from Lehigh coal slack by myself, at the Delaware Chemical Works, or at those of Messrs. Baugh & Sons, of this city, who have had the kindness to give me all the facilities for my experiments.

I am going to manufacture some tons of it, so as to be able to test publicly the burning qualities of this fuel, and will send you the results of my experiments."

Philadelphia, Pa. EMILE F. LOISEAU.

—*Journal of the Farm.*

On Colors from Coal Tar.

By HARRY N. DRAPER, F. G. S.

[From a Lecture delivered before the Royal Dublin Society.]

A few evenings since, when I was thinking how I might best place before you this subject of colors from coal tar in an instructive, and at the same time, if possible, an interesting manner, I chanced, in a very charming book, upon a passage which, with your permission, I will read to you.

"Yesterday forenoon, writes a friend, I went to the South Kensington Museum. It is really an absurd collection—a great deal of valuable material, and a great deal of perfect rubbish. The analyses are even worse than I was led to suppose. There is an *analysis of a man.* First a man contains so much albumen, and there is the albumen; so much phosphate of lime, fat, hæmatine, fibrine, salt, etc., etc.; then in the next case, so much carbon, so much phosphorus, a bottle with sticks of phosphorus, so much potassium; and there is a bottle with potassium, calcium, etc. They have not bottles of oxygen, hydrogen, and chlorine, but they have cubical pieces of wood on which is written, 'The quantity of oxygen in the human body would occupy the space of 170 cubes of the size of this.' What earthly good can this do any one?"
—BROWN, *Horæ Subsecivæ.*

Now, when I tell you that, did I not stand in such close proximity to the admirable museum of this society, and in awe of the unfavorable opinion of some friends of mine whom I see here, and whose opinion I respect, I should be much disposed to say "that, very little good indeed;" you will understand that it is not without diffidence that I ask your attention to the somewhat formidable array of specimens which you see upon the table, or to the diagrams which hang against the wall. It is not that I have large sympathies with those, who, thinking the best part of a scientific lecture to be the experimental one, are ever on the alert for brilliant coruscations of light, and for explosions, but that I realize most fully the great difficulty of conveying anything like an accurate idea of complex chemical changes, with the opportunities and within the limits of a single lecture; and when we have, too, in the same hour, to occupy ourselves with the practical results of an important industry like this. However, as I have introduced the diagrams to your notice, it is but fair that I should be their apologist; and while, I think, I may say that they need not be a cause of uneasiness to us, I hope that when (as is but too probable) I come to use hard words, they will be a positive help, and give us some notion of what the hard words mean. And, as regards the specimens, I think when I say that each of them represents a fact, and often a very beautiful fact in chemistry, that each one of them has its own peculiar application in the arts or manufactures, and that they are, without exception, products of that wonderful fossil flora which we call coal, you may be disposed to view them indulgently. I shall hope, too, to give them new interest in your eyes as we proceed; and it will be well if, at the outset, we get a clear idea of the object before us. We propose to trace the *useful*, as represented by this black, unsightly coal, in its progress towards the *beautiful*, as exemplified by the brilliant dyes with which we have been familiar during the past fourteen years. The mind, even when accustomed to chemical changes, and trained by experience to expect what would otherwise be startling results, does not easily grasp the conception that the millions of tons of coal which, in these islands, await the hands of the miner, represent a vast magazine, not only of light and heat, but of color-giving substances, which vie in splendor with the tints of the most gorgeous exotics or the varied plumage of tropical birds.

All who hear me know, that in the manufacture of gas, coal is distilled in large retorts, made either of fire-clay or iron, from each of which a vertical tube rises. A number of these retorts are arranged together in a furnace; the retorts are made red-hot, and distillation at once commences.

Both the gas and the oily products of the coal pass up a vertical pipe, and (as this bends on itself) down again into what is called the "hydraulic main." Here all which is not gas condenses, and as the condensed liquid accumulates, it flows into a tank prepared for it. Coke alone remains in the retort. The condensed liquid is *coal-tar*—the body which interests us to-day. Now, this coal tar is, by distillation at a lower temperature, itself separable into two bodies—*pitch* and *tar oil*. The pitch is, as we know, used for the formation of the artificial asphalt, employed for footways, and in the manufacture of coarse black paints or varnishes. In this and other ways all the pitch which it was worth while to make found an outlet; but, because there was almost no other use for the tar oil than "creosoting" timber, it was almost without value. A glance at the diagram which we have here will show us that coal-tar is by no means a simple body. Hofmann, indeed, very properly speaks of it as "one of the most wonderful productions in the whole range of modern chemistry." We must not forget that not one of all these substances tabulated here exists *as such* in the coal itself. Indeed, if we were not aware what remarkable changes the simple application of heat is capable of making in most bodies, we should not be prepared for such a splitting up of what, at first sight, seems a very simple body indeed, into all these compounds. This action of heat sometimes shows itself in a very remarkable way. Here is a body: it is a compound of cyanogen and sulphur; and you see, that, as we have it here, it consists of small white lumps of a loosely-aggregated powder. Now, if I apply heat to this body, it changes its form in a very remarkable manner; and, having seen this change of form, you will readily understand that its chemical properties and chemical composition have also undergone complete change. So it is with coal: the mere application of heat, to a certain degree, not only changes its form, but resolves it into all these bodies, each of which has some important chemical difference from its neighbor.

Perhaps, if we only knew how to go to work, we should discover that there are very few things in na-

ture from which we could not obtain color. But the tendency of these component parts of coal-tar to form colored compounds is very remarkable. I might show you this by more or less elaborate methods, with almost any one of them; but here is one of the simplest examples. I mix a few drops of this body, which, as we shall have more to say to it presently, I will not describe now. I mix it with the water in this jar, and then add a solution of a persalt of iron. You see we have a violet coloration at once developed. But there are *five* constituents of tar, in which the tendency to give color is so very marked that all the interest of coal-tar, as a practicable source of color, centers in them. These five bodies are benzole, toluole, phenol, naphthaline, and anthracene; and it is from these alone that the coal dyes are obtained.

Now, in separating these substances from coal-tar oil, advantage is taken, firstly, of differences of boiling point; and, secondly, of the various behaviour of these bodies with acids and alkalies. Glancing at the diagram, we see, for instance, that *benzole* boils at 84°; *toluole* at 114°; and *phenol* at 188°; so that, if we subject a mixture of these three bodies to distillation, we shall obtain—first, the benzole; then, as the temperature increases, the toluole; and, finally, when the thermometer reaches 188°, the phenol.

[To be continued.]

Terrible Gas Explosion at Leeds, Eng.

One of the most serious explosions which have ever occurred at a gas work happened early in the morning of Monday, November 13, at the works of the Leeds Corporation, situated in Wellington Road, New Wortley, a western suburb of the city.

The works at New Wortley are unfortunately very crowded. The purifying-house is in close contiguity to the retort-house, and near by are the engine and boiler houses. The retort-house contains 280 retorts, which were all in operation at the time of the accident. The purifying-house is a building about 60 feet in length and 42 feet wide, having 18-inch walls, carrying a slated roof of the description known as a "jack roof," the ridge being raised, boxed, and open for ventilating purposes. It contained four purifiers, each 22 feet by 16, resting on brick pillars, the foot space all round them being, we gather, floored with wooden boards, under which passed all the connections, including, of course, the inlet pipe from the exhauster. The inlet-pipe in one corner of the building was drained by a self-acting syphon, with dip-pipe into an open overflow cistern. To this place an escape of gas was traced, which had been going on, according to the witnesses, for from twenty minutes to three-quarters of an hour. The cause of the escape can hardly be doubtful. It will be at once surmised that from some obstruction, either in the purifiers or connections, the seal of the dip-pipe became insufficient to resist the pressure of the purifiers; the water was therefore blown out, and the gas escaped into the enclosed space between the bottoms of the purifiers, the wooden flooring, and the ground.

The manager, Mr. Scholefield, whose promptitude and courage were beyond all praise, at once took steps to correct the defect by endeavoring to fill up the syphon-box with water; but the cistern could not be got at without removing some of the wooden flooring, and on doing this a vent was given to the pent-up mixture of gas and air, which made its way to the boiler-furnace, and there became ignited. The result was an explosion, which for its destructive effects has seldom been equalled in gas works. The roof of the purifying-house was utterly destroyed, two of the purifiers were completely shattered, and the other two are greatly damaged; the centre-valve and connections were all broken to pieces. Nor was the damage confined to the purifying-house. Behind it was a shed, the roof of which was blown away, and alongside, though partially separated by walls, were two large scrubbers and the condenser; the former are destroyed, but the latter escaped uninjured. At a distance of thirty feet from these is a gasholder, the crown of which had a rent made in it ten feet long; this, however, was promptly stopped with clay, and the stock of gas saved. In the open yard in front of the engine-house were two other smaller purifiers exposed to the air, and these also were completely destroyed. The explosion, of course, ignited the gas at the place of escape, and it continued to burn until the charges of the 280 retorts were drawn, under the direction of Mr. Smith, the engineer to the corporation.

It is too early, perhaps, to comment fully on this disaster, but we may point out at once the advantages and safety of the plan first practised by the late Mr. King, of Liverpool, who erected his purifiers on a stage with an open space below. When such a space is enclosed by four walls, it necessarily forms a sort of close end, in which an explosive mixture accumulates, and gives force to an explosion if the mixture should happen to be ignited. Mr. King's plan, which has been adopted in all recently constructed works, will doubtless be followed when the Leeds works are rebuilt.

Silly people will see in a rare accident of this kind a strong argument for the removal of gas-works from towns though there is much less danger in connection with them than with the steam boilers numerous in every street of a manufacturing city. These often burst, dealing death and destruction around them, but no one is so foolish as to demand their removal.—*Jour. of Gas-Lighting, Nov.* 21.

Public Demand for Practical Instruction About Gas.

We have before us, says the London *Journal of Gas Lighting*, a new edition, the hundred and ninety-eighth thousand, of Mr. Rutter's little work on the "Advantages of Gas." It seems extraordinary that a work of this kind should be called for in these days, yet daily experience shows how completely ignorant the majority of people are as to the nature of gas, its safety, and its cheapness as a source of light, and even of heat. The section on "An Escape of Gas" is alone calculated to save many lives and much property, if the suggestions there made were always acted on—if, when people perceived a smell of gas about a house, they would open the doors and windows, turn off the main tap, and send for a gas-fitter, instead of immediately striking a lucifer to look for the leak.

There is sound advice, too, in the section "On Gas Fittings," especially in the recommendation to consumers to have pipes of sufficient size provided. At least one half of the complaints of deficiency of supply are owing to the smallness of pipes laid to furnish it. So with regard to burners and glasses. Mr. Rutter says, with truth, that "to badly-made burners, and inappropriate or neglected glasses, may be traced the principal part of the complaints about gas. Whilst its illuminating power has been increased and its price reduced, the consumers, for whose benefit it is intended are not realizing what is provided and intended for them; nor will they, unless fittings, burners, and glasses receive proper attention."

Mr. Rutter is a strong advocate of the use of gas for cooking and warming, and as it is very desirable to extend the consumption for the former purpose in the summer months, some space might well have been devoted to a short account of some of the best apparatus to be used. Frying or broiling over a gaslight is a simple operation, but few people are acquainted with the simple and economic apparatus for baking and roasting, which they might be glad to adopt in summer, when a fire is required for no purpose but cooking. We have often urged upon gas companies the duty of advising their new customers on the best arrangements to be made for the consumption of gas, and we do not know that they could do better than put this little book into their hands.

Knoxville Gas Works.—We learn through the columns of the Knoxville *Daily Chronicle*, that Prof. W. O. Atwater, of the East Tennessee University, accompanied by his class in Chemistry, visited the gas works on the 6th inst., in order to witness the manufacture of coal gas. Every portion of the works was clearly explained by the gentlemanly superintendent, Mr. James Somerville. The young gentlemen were pleased with their visit, and no doubt were greatly aided in the pursuit of their studies. As soon as this company shall be unencumbered with their present law suits, two or three additional miles of gas mains will be laid, and a reduction of the price to consumers will be made. East Knoxville, North Knoxville, and the East Tennessee University will then be supplied with gas.

A Contested Gas Bill.—An important gas suit of the proprietor of the Louisville Opera House against the Louisville Gas Company for overcharge, involving the correctness of gas meters, was decided on the 9th instant in favor of the company. Most thorough calculations and test experiments were made by scientific men, in the court room, during the trial, and the meters were found to be wonderfully correct under all tests.

Note on Pure Carbolic Acid.

By Professor Church, M.A.

Since 1856 I have occupied myself a good deal with experiments as to the practical hygienic applications of carbolic acid, particularly as to its use in dentistry and in throat affections, and also as regards its employment as a disinfectant. The rank of carbolic acid as a most valuable contribution from chemistry to medicine is so well assured, that it is unnecessary to insist upon this point here. Yet there is an objection urged against this substance, which has some apparent force, simply because the best preparations of commerce are so seldom free from a gas-like or naphthalic odor, which, though entirely foreign to carbolic acid itself, has condemned its use in some quarters. About eleven years ago, in preparing pure carbolic acid for the use of a surgeon-dentist to whom I introduced it, I adopted a plan which I shortly afterwards described before the Odontological Society, and to which I have been lately asked to give greater publicity. My plan, which is very simple, is as follows:

One pound of the best carbolic acid of commerce (I use Calvert's white crystallised acid) is poured into twenty pounds of cold distilled water, taking care not to permit the *whole* of the acid to enter into solution. With a good sample, if after shaking repeatedly at intervals, between two and three ounces of the acid remain at the bottom of the vessel used, this will be a sufficient residue to hold and contain all the impurities. With bad samples, less water must be used or more acid. The aqueous solution should be syphoned off, and filtered if necessary through Swedish paper till perfectly clear; it is then placed in a tall cylinder, and pure powdered common salt added, with constant agitation, till it no longer dissolves. On standing the greater part of the carbolic acid will be found floating as a yellow oily layer on the top of the saline liquor, and merely requires to be removed by a syphon or pipette to be ready for use. As it contains five per cent or more of water, it does not generally crystallize, but it may be made to do so by removing it to a retort, and distilling it from a little lime. The portion collected up to 185 deg. C. or thereabouts has at ordinary temperatures scarcely any odor, save a faint one resembling that of geranium leaves; and I have taken advantage of this curious resemblance still further to mask the slight smell proper to absolutely pure carbolic acid by the addition to it of four drops per fluid ounce of the French oil of geranium. This addition has the further advantage of liquefying the pure crystallized product.

The carbolic acid purified as above has been so highly appreciated by those professional and private persons to whom I have distributed samples, that I have thought it best to publish my simple plan, for which, however, I claim no originality. It involves, I know, considerable loss of material, but the saline liquor remaining may be distilled and thus made to yield up a second portion of pure carbolic acid, and it will be found a very pleasant and effective domestic disinfectant and deodorizer.

When dissolved in 230 parts of water and used as a gargle, or in 25 parts for painting the throat, or in 50 parts for a carbolic spray, the pure acid is rarely, if ever, objected to even by the most fastidious person. Of course it may be readily mingled with olive or other oil (1 : 25) or with glycerine, for dressing cuts and sores, and when introduced into the little air-purifier invented by me and noticed in your columns some months back, diffuses wholesome and inoffensive vapor in any place where there are disagreeable effluvia of vegetable or animal origin.—*Chemical News.*

The Manufacturing Industry of Scotland.

In winding up the business of the British Association meetings held in Edinburgh, the members of the various sections visited places of interest to their associates. One of these interesting meetings included a short run by rail to the Addiewell Paraffin Oil Works, West Calder.

This excursion, chiefly promoted by members of the Chemical Section, left Edinburgh on Saturday, in order to visit the well known Addiewell Paraffine Oil Works. The party assembled at the Caledonian station at ten o'clock. The large extent of these works may be supposed from the fact that they cover an area of nearly 51 acres, and employ about 1500 work people. They were commenced only seven years ago, and now contain no less than 3,540 retorts, capable of distilling more than 3000 tons of shale per week, and producing 120,000 gallons of crude oil, which yields

50,000 to 60,000 gallons of burning oil, in addition to about 12 tons of refined paraffine oil, and a large quantity of heavy lubricating oil. From the ammoniacal water several tons of ammonia are produced weekly. The party was first shown the retorts where the first process in the manipulation of the shale is carried on —its distillation. Next they were conducted to furnaces where the only fuel used was the soluble incondensable gas; then shown the ammoniacal water from which the sulphate of ammonia is extracted, and the paraffine oil in its crude state.

The departments where the refining processes are carried on were next visited. Here were seen an apparatus for distilling the crude oil, and a chemical refinery where it is treated with sulphuric acid. Then the distilling-boilers, where the oil is separated from the ammoniacal water, and afterwards acted on by chemical substances, were visited. The sulphuric acid manufactory was next inspected. and apparatus capable of manufacturing thirty-six tons of pyrites per week. These substances are manufactured only for the use of the company in refining the oil. Kirk's refrigerating mrchine was also seen in motion, where by the compression and subsequent expansion of the air, the brine is cooled which is used for cooling the heavy oil from which the solid paraffine is made. The processes of making paraffine and purifying it till it exactly resembles newly-cut blocks of ice, were also seen; and, lastly, the formation of this purified paraffine into the candles. Abovt 500 tons of candles are here manufactured in the year. The company did not visit the shale pits, which number ten or twelve, and are in close proximity to the works.—*Lundon Mining Journal.*

Trial of the New York Gas-Light Company as a "Common Nuisance."

We have already referred to this case, in our issue of October 2d. The argument on the Bill of Exception filed by the Counsel of the Company, Mr. Francis Lynde Stetson, is to take place next month before the Supreme Court. We put on record, as a curiosity, the indictment of the Grand Jury in this case.

CITY AND COUNTY OF NEW YORK, ss.

The Jurors of the People of the State of New York, in and for the body of the City and County of New York, upon their Oath, present:

That the New York Gas-Light Company, late of the eighteenth ward of the city of New York, in the county of New York aforesaid, on the first day of October, in the year of our Lord one thousand eight hundred and seventy, and on divers other days and times between that day and the day of taking this inquisition, with force and arms, at the ward, city, and county aforesaid, near the dwelling-houses of divers inhabitants of the city and county of New York, and also near divers public streets and common highways in the said city and county of New York, then and there unlawfully and injuriously did make, erect, and set up, and did cause and procure to be made, erected, and set up, divers furnaces, tubes, and cylinders, for the purpose of manufacturing illuminating gas, and that the said The New York Gas-Light Company on the day and year aforesaid, and on divers other days and times between that day and the day of taking this inquisition, at the ward, city, and county aforesaid, unlawfully and injuriously did make divers large fires of coal and of other offensive materials and substances to the jurors unknown, and did cause and procure divers large fires of coal and other effensive materials and substancee to the jurors unknown to be built in, on, upon, and around said furnaces, tubes and cylinders, by reason of which said premises divers noisome, offensive, and unwholesome smokes, smells, and stenches, during the time aforesaid, were from thence emitted and issued, so that the air then and there was and yet is greatly filled and impregnated with the said smokes, smells, and stenches, and was and is rendered and become and was and is corrupted, offensive, uncomfortable and unwholesome, to the great damage and common nuisance, not only of all the inhabitants of the said city and county of New York there residing, inhabiting and dwelling, but also to the inhabitants of said city of New York, then and there passing and repassing in, by and through the said public streets and common highways, contiguous to the said common nuisance, and against the peace of the people of the State of New York and their dignity.

S. B. GARVIN, District Attorney.

THE GAS-WORKS at Winsted, Conn., exploded December 7th., and two men were severely injured thereby.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—EDS.

The Meter Controversy.

BOSTON, MASS., November 20, 1871.

Mr. Editor: On Tuesday last my attention was called, for the first time, to the statement lately made by Mr. Keehng, respecting gas works, meters, etc.

As an Englishman I am exceedingly sorry that any fellow-countryman, claiming the least pretension to a knowledge of the business, should publicly make assertions, not only altogether unjustifiable in the present advanced state of the trade in general, but equally so if applied to it at any period of its history.

I have not been in any way connected with the gas trade for some years. My attention was called to the subject by Mr. Isaac Fonseca, who has the management, in Boston, of the meters manufactured by the American Meter Company. To my knowledge he has been constantly employed in the meter trade for the last twenty-five years. He requested me to satisfy myself as to the correctness and reliability of the meters sent out by the above mentioned firm. I accordingly took a five-light meter haphazard from among a large quantity standing ready for sale, tested it and found it quite correct. On looking at the Inspector's seal I found he passed it January 31, 1871: since which time the meter has not been touched. The following day I took the number to the State Inspector's office, and asked him for his assistant's report; he told me it was correct. Mr. Fonseca informed me that any one interested in the subject may, at any time make a similar test with any of their meters, and he will risk his reputation on the assertion, that in almost every case the result will be equally satisfactory. Any respectable meter maker, I presume, would be willing to do the same.

If Mr. Keeling knows anything about the matter at all, he must be aware that as an instrument for measuring gas, the meters as at present made is more to relied on than watches in general for time. I do not suppose a watchmaker could be found who would guarantee his watches as Mr. Fonseca does his meters, to be quite correct after standing idle for perhaps a year.

The public has been misled long enough on the subject of gas meters. Let any person using one made by any of the recognized makers of the present day, rest assured he has an instrument he may safely rely on to do him justice; and if at any time he pays for more gas thad he has consumed, it will be through some carelessness or neglect on his own part; not one time in a thousand will it be through any fault of his meter.

For his own sake, as well as for the benefit of the public, I hope that Mr. Keeling has succeeded in producing a regulator that will perform its duties only equally satisfactory with the meter; and then, if such proves to be the case, I shall not despair of seeing the problem solved, of perpetual motion. H. C.

Easton Gas Works—Construction of Gas Holders.

EASTON, PA., November 24, 1871.

Mr. Editor: It is now some time since you have heard from our works. I thought it would be well enough to let you know how we are getting along. It is now nearly three years since we are using clay retorts; at first we were nct so successful. The great trouble was to avoid the accumulation of carbon. We were runniug pretty good heats, and had one inch dip in hydraulic main; we found that the carbon was a great injury to retorts. But since we are working without a dip, we have very little trouble with carbon. One bench with a pretty good heat run nine months before we had occasion to remove the carbon; of course we use an exhauster. Our yield of gas has been for 1870, 4 6-10 feet per pound. We carbonized 1,419 net tons; amount of gas made, 13,006,300 feet. This year the yield will be about the same; our consumption will run up to 75,000 feet per night in December. It has nearly doubled in three years. The largest consumption in 1868 was 45,000 feet, so you see we are increasing, Last year we built a new purifying house with four boxes, eight feet by ten feet, with eight inch connections, upright condensers, and washer, all in one building. All who have visited us say it is one of the finest purifying houses they ever saw for works of our size. We will soon be in want of more holder room, and in a few years will be compelled to build a larger holder; fortunately we have plenty of room now.

I wish to say a few words about gas holders, and how they are constructed. I was at a neighboring town a few days ago, where they were building a new holder, sixty feet in diameter, without any braces to strengthen the crown of the holder. Now, this I think is a great mistake, and have thought so since the two explosions, as they were called, at Cincinnati. I have always been of the opinion that the holders mentioned gave way by mere pressure of gas on the crown or top of holder, and I will give you my reasons. At the place where I saw them building a holder, they were just about finishing the top. and I saw them put in a sheet that was a little short; they took their punches and drew it up, and riveted it. Now, when the pressure of the gas raises the holder, of course the whole weight of the holder is on the crown, and the sheet that is a little short gets more strain than it is able to bear; the consequence is, the crown must give way. If the pressure could be fairly distributed there would be no use of braces.

In looking over the Journal of July 16, 1869, the superintendent of the Cincinnati works says he first saw the top of the holder open, the gap being about ten feet, before it took fire. There is no doubt had this holder been well braced, or the crown strengthened by iron rods, the accident never would have happened. Builders of holders should take this into consideration, and not run this risk, for the sake of a trifling expense. I remain yours, etc.

S. TRUMBORE,
Superintendent Easton Gas Works.

Tar Pavement.

MARIETTA, OHIO, November 24, 1371.

Mr. Editor: I see in your valuable paper of November 16, a report read by Mr. G. Anderson, on "Further Experience in Tar Pavement," which induces me to ask, if consistent with other duties, to give in your Journal, or otherwise, the process of making tar pavement, as particularly as possible. We have a coarse gravel, taken by dredging machine from the bottom of a river, which I suppose would be good and very convenient for making pavement. Should the gravel be first spread, and tar put on it, or mixed with tar before putting down? Should the tar be boiled; put on hot or cold? Should the gravel be hot? Should it be put down in layers? If we can learn how to make tar pavement we can find use for our surplus tar. Very respectfully, yours, etc.

SAMUEL SHIPMAN,
President Marietta Gas Co.

[We shall take the liberty to suggest to Mr. Shipman, as we ourselves have had no practical experience with tar pavements, and not much opportunity to observe the operation of laying them, that he should address on the subject M. T. Cox, Superintendent of the Gas-Light Company of New Haven, where such sidewalks are very perfectly laid. We judge, from our own experience of the courtesy of Mr. Cox, that he would give every consideration to such an inquiry from a brother of the craft.—ED.]

The British Coal Commissioners Report.

We can give the results arrived at by the commissioners in a very short space. They estimate the quantity of coal in ascertained fields, lying within 4000 feet of the surface, the lowest depth at which it can be practically worked, at 90,207 millions of tons. They conjecture that there may also exist at workable

depths, under strata not yet explored, other 56,273 millions of tons; making a total of 146,480 millions, which, at the present rate of consumption, would last 1273 years. But the commissioners are rather inclined to believe in a progressive increase in the rate of consumption, which they think may, in 100 years, amount to 415 millions of tons per annum; and if it stopped at that figure, the now estimated coal available for use would represent a consumption of two hundred and seventy six years.

Necessarily these estimates partake more or less of the nature of guesses, and should not receive more attention than they deserve. The facts remain, as stated by Mr. Hull in 1864, that "some of our coalfields have passed their meridian, and, having expended their strength, are verging on decay. Others have attained their maximum, or nearly so; this, indeed, is the case with the majority." And the result is seen in the market price of coals, which exhibits a continual increase.

To no one is this question of more interest than to gas producers, and we should have been glad if the report had afforded us, for one thing, any information or guess as to the probable extent and duration of our fields of cannel. The volume we now notice, however, is silent on a matter which is of the utmost importance in regard to future gas legislation. Coal which will yield by known processes from 10 to 14 candle gas may be abundant enough for centuries to come, but how long shall we obtain coal that will give from 20 to 30 candle gas.

It may be that subsequent volumes will give us the information we need, and if the commission do not pretend to have completed their labors, we would press the matter on their attention. But we think it may be taken as certain that the exhaustion of our beds of cannel is rapidly progressing, and that at no distant period the cost will be such as to prevent its use in the manufacture of gas. Remembering, too, that of other coals the best gas coal is being the most rapidly worked out, it becomes a most urgent question what the quality of our gas supply should be. Every year brings proposals and demands for supplies of rich gas, which, it is quite certain, cannot be maintained for many years longer. Under these circumstances the subject deserves the serious attention of all gas producers, We have no right to speculate on future discoveries; we have to deal with facts as they are known. That a substitute for coal may be found is an empty speculation which no man of science ever indulges; that any considerable economy in the use of coal may be effected by appliances for its consumption is in the highest degree problematical. In the natural course of evonts coal must continue to rise in price; and the condition of England is such that no man can guess what the price will be in twenty years time.—*Journal of Gas Lighting.*

The Gas Referees Report on Ammonia in Gas.

We take the following correspondence from the London *Journal of Gas Lighting:*

Sir: In the referees report on ammonia, containing as it does so much valuable information, there are one or two points that appear to me to need a word or two of explanation, which, with your permission, I will endeavor to give.

In the description of my scrubber, it is stated that "the open area or interstitial spaces in this scrubber are on the average three times greater than the area of the pipes which lead into and out of it." Fifty times greater would be much nearer the truth.

It is further stated that "the weak point of this scrubber is that it cannot eliminate the tarry vapor from the gas so well as the coke scrubber."

This, certainly, as far as I know, has not been proved; in fact, my experience is quite in the opposite direction. I have during the last twelve months passed the gas, after leaving the condenser, through a vessel of large area, the interior being perfectly open; the gas is thus brought nearly to a state of rest, and the tarry vapor which previously had been carried forward by the rapid current of the gas has now an opportunity of falling, the result being that much less tar now reaches the exhauster than ever before.

The statement that a scrubber of this kind was first adopted at the Haggerston works of the Imperial Company is a mistake. I fitted up the first at the South Metropolitan works in 1860, while that at the Imperial was done last year.

Mr. F. C. Hills, of Deptford, originally introduced the coke scrubber to the South Metropolitan works, and from the first the coke has always been arranged in separate tiers, with an open space between each. I do the same with the system of thin boards.

I was led to adopt this plan from a desire to avoid the expenses and inconveniences resulting from the use of coke. I sought and have found a means of exposing the gas to an immense area of wetted surface without resistance or possibility of choking. In a vessel 15 feet 6 inches diameter, fitted with about 31 tiers of 11-inch boards, there is a superficial area of upwards of 100,000 square feet, or considerably more than two acres.

I am free to speak in favor of my scrubber, because I am not and never have been in any way pecuniarily interested in its manufacture. Possibly I have found a scrubber fitted with boards more effective in removing ammonia than one charged with coke, both working under similar conditions. My scrubber does not in any way come into competition with Mr. Mann's system, for mine relates only to the interior filling, while his claim is for the even and constant distribution of the water, which I, being compelled to use a common Barker's mill, cannot effect so satisfactorily.

I thank you for granting so much of your space, and wish that gas men would more largely use your Journal as a means of discussing matters connected with the manufacture of gas.

GEORGE LIVESEY, Engineer.
South Metropolitan Gas Works, Sept. 7, 1871.

Safes and Vaults.

The experience of the late fire in Chicago affords much information regarding the relative merits of safes and vaults for the preservation of papers or other valuables. The work of digging out safes from the ruins, which was begun as soon as the heat of the smouldering piles would admit, resulted in proving the fact that safes, however well constructed, would not, under all circumstances, preserve their contents unharmed. Those placed in wooden buildings, as a rule, held papers and books in good condition; the materials of which such buildings were composed burned so quickly and entirely, leaving nothing remaining to smoulder and retain the fire, that safes did not become heated through. But in buildings of brick and stone the result was more unfortunate. The safes fell among masses of material which burned steadily, and gave forth intense heat for days after the first fire, and thwarted any attempts made at removal. The safes lying in the midst of such heaps of fire became intensely heated throughout, and when efforts to remove them were finally successful, their contents were found, in many cases, to be ruined. Books, papers, and bank-notes still retained their form, but had changed to black in color, and, upon the slightest touch, crumbled into powder. In almost an exact proportion to the length of time they had been forced to remain in the burning ruins, safes were found to have preserved their contents uninjured or partially or totally destroyed. It is evident that, while a well-constructed safe will hold uninjured books and papers, yet remaining in the fire for a long period, no one yet made will fulfill its purpose. With vaults the result proved entirely different. In nearly every instance well built vaults held their contents intact. Bricks and mortar proved excellent non-conductors of heat, and upon the opening of large vaults which stood for some days in the midst of fire, their interiors were found scarcely warm.

These discoveries will doubtless have the effect of introducing more largely the construction of vaults in buildings largely devoted to business uses, and the disasters resulting from their faulty construction, of which the one in the Custom House furnished a notable example, will perhaps induce more care in building. A vault badly built is worse than a poor safe, for the latter does afford a degree of protection to what is within it, while the former gives no protection at all.

It must not be inferred from the statements made above, that safes buried in the ruins of the late fire did not accomplish a great degree of good. Property of immense value was preserved through their agency, and where not exposed to heat of the most intense character, and for a long time, the safes generally stood the test well, and reflected credit on the makers, and must continue to be used, even where faults exist, for, to secure perfect safety, valuables must be placed in a safe surrounded by a vault; and, for ordinary fires, safes have proved themselves equal to all requirements. But for such occasions as the late fire, only vaults can afford the perfect security needed.—*American Builder.*

ARTIFICIAL SAUSAGE SKINS.—During the recent war in Europe, so great was the demand for sausage skins that recourse was had to a substitute. The Berlin pea sausage factory for some time consumed daily a hundred thousand skins; but soon the supply began of run short; parchment-paper was suggested as a substitute. The difficulty in the use of this material was to paste the edges of the paper containing the sausage together, ordinary paste being useless for this purpose. Dr. E. Jacobsen, however, prepared a paste which kept the edges firmly united after several hours boiling, and of which five thousand pounds were used for pasting sausages. Several layers of parchment paper united with this paste closely resemble parchment in appearance and strength, and the material thus produced would be very valuable for many purposes, such as book-binding and the like. Parchment paper may be firmly pasted to linen cloth with the same paste, and the article thus produced is a water-tight paper-linen, very well adapted for packing purposes. The composition of the paste is unfortunately not disclosed.—*M'f'r and Builder.*

[We suggest that such a paste would doubtless be furnished by the ancient mixture of egg-albumen and calcic hydrate, referred to in a note to one of our "Excerpts," in the last issue.—ED.]

SCARCITY OF COAL AT CINCINNATI.—The *Commercial* estimates the supply of coal at Cincinnati at 330,000 bushels. The gas company have about 800,000 bushels on hand, but that cannot be purchased. The average consumption in the city at this time is 75,000 bushels per day. In winter the consumption varies from 100,000 to 125,000. For the first time for several years a successful attempt has been made to bring coal into the city by railroad, but owing to difficulties in delivering it, even that source it is said will not be sufficient to prevent a famine. The price of coal a few weeks ago was $6.50 per load—twenty-five bushels—for railroad, and $8 for Youghiogheny. There is little of any other kind of coal in the market.

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]
December 16, 1871.
DELIVERED IN NEW YORK.

English Cannel.			
Ince Hall	$11 50	@	12 00
Kirkless Hall	11 00	@	11 50
English Caking Coals.			
Newcastle Gas	$7 50	@	7 75
Liverpool caking	7 25	@	7 50
British Province Coals.			
International			6 00
Little Glace Bay			6 00
Pennsylvania Coals.			
Penn Gas Coal	$7 00	@	7 15
Westmoreland	7 00	@	7 15
Shafton	7 00	@	7 15
Youghiogheny	7 25	@	0 00
West Virginia Coals.			
MurphyRun	$6 70	@	7 00
Despard	6 70	@	7 00
West Fairmont			7 00
Fairmont	6 70	@	7 00
American Gas Coal	6 70	@	7 00
Newburgh Orrel	6 70	@	7 00
Pinnickinick	6 70	@	7 00
Cloverhill of Virginia	5 25	@	6 00
McKenzie Compound Mixture			8 00
American Cannel Coals.			
Peytons of West Virginia	$13 50	@	12 75
Darlington of Pennsylvania			— —
Asphalts.			
Albertite of New Brunswick	$16 00	@	17 00
Ritchie Mineral of West Virginia	— —	@	15 50
Trinidad Bitumen	— —	@	14 00

S. L. MERCHANT & CO.,
76 South Street,
(Corner Maiden Lane) NEW YORK.
AGENTS OF
J. B. White & Brothers
CELEBRATED (London)
Portland Cement.

Gen. Gilmore of the Engineer Corps of the United States Army uses it as follows:

FOR WALLS, FOUNDATIONS AND ARCHES.

1 Barrel of White's Cement to 1½ Barrel Slack Lime in powder; 7 Barrels Sand; 12 Barrels Gravel; 14 Barrels Concrete Stone.

For Foundations and Walls Gen. Gilmore says:

1 Barrel of Sand; 14 Barrels of Concrete Stone; 14 Barrels of Gravel; ½ Barrel of Lime unslacked, which combination will make 105 Cubic Feet of Concrete.

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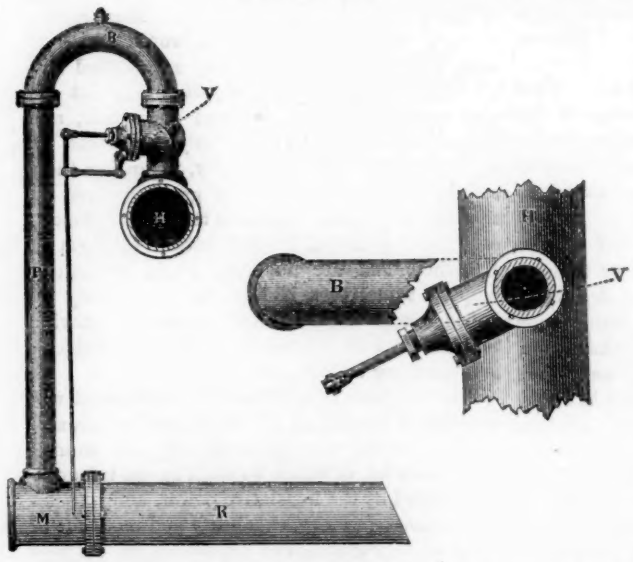

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SATURDAY, DECEMBER 16, 1871.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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General Editorials.

GRAHAMITE.

For many months, there have been articles floating about through the Journals, relating to the use of this American mineral for paving purposes, by some joint stock company, we believe, here in New York. Of this company, or of the pavement laid by it we know rather less than nothing, and should not allude to the subject, were it not that the name of the Editor of this Journal is constantly introduced into these articles in a manner unauthorized by him, unwarranted, and calculated to mislead some. From one of these articles which, we believe, appeared first in the *Scientific American*, we excise the following passage :

"The reader will by this time be impatient to know what this remarkable material is. When first discovered it was thought to be coal, and was analyzed as such by Dr. Doremus of this city. Subsequent examination by Professor Wurtz, editor of the AMERICAN GAS-LIGHT JOURNAL, showed that it was completely soluble in various well known *menstrua*, and he pronounced it a mineral resin. Professor E. J. De Smedt claims that it is in character similar to the Seyssel asphalt, but that it contains a larger proportion of asphaltene, which is difficultly fusible, and a very bad conductor of heat. He therefore in a communication to the *Scientific American* of March 5, 1870, called it the "*American Asphalt*," and pronounced it far superior to the Seyssel asphalt for road making."

Now who "Professor E. J. De Smedt" is, is to the writer unknown. Doubtless this merely argues the writer himself unknown to Professor E. J. De Smedt.

The above, however, if emanating from Prof. E. J., shows that there are many other things unknown to that gentleman. For example, the nature and history of "asphaltene" and secondly the nature of grahamite, are both unknown to him.

The story of asphaltene is as follows :

Thirty-five years ago, when little or nothing was known of the chemistry of carbohydrogen minerals, the French chemist Boussingault made an examination of a material called asphaltic tar, or "mineral grease," from Bechelbronn, near Strasbourg. He found it wholly soluble in ether. On distilling it, he obtained at 500° F., or higher, 85 per cent. of oil, which he supposed existed, as such, in the tar, and hence he called it "petrolene." The residue, still soluble in ether, he baptized *asphaltene*. Every body, nowadays, who knows anything at all of the subject, knows that both petrolene and asphaltene must have been both mixtures and products of decomposition or *educts*, and did not exist, as such, in the mineral tar of Bechelbronn; and no man of science would now admit these names into scientific nomenclature, except as merely of historical interest.

Boussingault jumped to the conclusion that all solid asphalt-substance was ; and on analysis found in the latter 15 per cent. of oxygen. He then examined a solid "asphalt" from Caxitambo, Peru, which, containing also about 15 per cent. of oxygen, he concluded was pure asphaltene. Three years later, however, it happened that Boussingault analyzed the Caxitambite by improved methods, and found *no oxygen*! Hence his asphaltene analysis is worthless. Other chemists have since analyzed materials from solid asphalts, which were soluble in ether, and therefore supposed to be asphaltene, and found them to contain no oxygen. Now Prof. Doremus, in the analysis reported by him of grahamite, found some fourteen per cent. of oxygen.

From 80 to 85 per cent. of grahamite is totally insoluble in ether, as well as naphtha, through the whole of it is soluble in chloroform, benzole etc.

So far as we yet know, though we know very little about such substances, grahamite is totally distinct from *asphalts* (which is now a very obscure and indefinite term) and from everything else. Both the West Virginia and the Colorado grahamite, are chiefly composed of a material (left after extracting the 15 per cent. or so, soluble in ether and petroleum-naphtha) which has been called by the writer "irisine." (See his paper on grahamite, read to the American Association at Salem, in 1869; this Journal, Oct. 2, 1869, p. 98). Irisene might possibly be preferable. This substance is unique in properties so far as known, among carbohydrogens, being *infusible* at any temperature, while perfectly soluble in many liquids.

PRACTICAL INFORMATION ABOUT GAS, FOR THE PEOPLE: WHENCE SHALL IT COME?

In another column we take from the London *Journal of Gas-Lighting* the remarkable fact that there have been sold in London since 1859, the year of publication, nearly 200,000 copies of a small book written with the object expressed in the above heading, being at the average rate of sixty copies per day for the whole period. Here is a hint for some enterprising American publisher; but this is not the particular moral with which we intend to adorn the tale. Mere republication of Mr. Rutter's book would scarce do now, unless it were completely remodelled and rewrittten. Our present object is to point out that the passive ignorance and endurance, and even apathy, which is apparently manifested by the American public generally, regarding their own interests as consumers of gas, is proved by this fact to be more apparent than real. Americans have as much human nature in them as Britishers, and are no more likely to neglect helping themselves, if they can. Certainly we have no more right to assume that the craving for education of a practical kind on any subject, is less among us than over the water.

What we have now to say is this : That it will certainly be the fault of the people of this metropolis, if the new era does not now shortly dawn upon us, in which we shall have a tribunal, established by the legislative power, and possessing authority, ability, capability and rectitude of purpose, to regulate and adjudicate all matters that may be at issue between producer and consumer It will then become the occupation and duty of this tribunal, to inform, and keep informed, both of these classes, producers and consumers, in the most thorough and practical way, how gas may be made to the best purpose, and consumed with the least waste, and to see that its dictates are carried out and its instructions circulated throughout the whole community.

There is *no longer* the slightest reason why the present winter should not see the establishment of such a tribunal. The public press has been filled with suggestions, both from editors and correspondents, all tending in this direction; each and every writer amusingly fancying that he has struck out an idea of great boldness and originality.

We cannot think of making selections even from among this great mass of the literature of the day, and must be satisfied with but one excerpt. This one, however, is of so remarkable and interesting a character, and from a source so elevated and respectable, that it should be co-clusive, and serve to settle the question alto-

gether. We refer to a paragraph which we shall proceed to quote from a letter in the New York *Daily Times*, under date of November 28th, from the gentleman who stands at the head of the Directory of the wealthiest and most influential gas corporation on this Continent, and whose testimony, from his long and varied practical experience, and upright character, we are justified in regarding as having been prompted alike by justice and by judgment. *La voila* :

"It has been urged that the gas furnished by the various companies should be tested, and that competent men independent of the corporations should be appointed for that purpose. To this I am confident the companies would not object. In our works the gas is tested every day, and its illuminating power recorded, and this has been the custom for years. Testing to ascertain its purity is of almost hourly occurrence day and night. If public testers are to be appointed, let them be skilled chemists, and gentlemen in whom not only the public, bfit the companies can have confidence, men of independent as well as educated minds. If any change in existing laws is desired for the better protection of the public let the case be fairly stated, for I am convinced that all that the companies will ask is that a spirit of fairness on the part of the people should be exercised, and that the complaints, when well founded, should be brought to the companies' notice, and the simple privilege accorded of being allowed to remedy the evil if possible.

CHARLES ROOME,
President Manhattan Gas-Light Co."

During the legislative session of 1868-9, as we stated in our last, a bill was prepared and almost unanimously passed the Assembly, involving features substantially identical with those here set forth by General Roome. We can no longer listen to those captious individuals who asserted on that occasion that it was the secret opposition of the City Companies which quashed this bill in Senate. The writer may here add that even his own scientific colleagues, designated (by the Legislative Committee sent here to investigate) to cooperate with him in preparing a report on the subject to the Legislature, declined to do so, on the ground that the job, while wholly gratuitous (as it doubtless was) and thankless ; was also hopeless, for lack of sympathy and cooperation (not to speak of the antagonism) of the great Gas Companies themselves, and their friends.

This brings us to *our own* suggestion. If the public is really in earnest again in this thing, and it comes up at Albany this winter, *our* plan would be to avoid the shoals that may have wrecked the former bill. This time we would have the Gas Companies themselves called into the council-chamber. General Roome is doubtless abundantly warranted not only in speaking for, but also in acting for, all of them. Let this gentleman be requested *himself to act with a commission* for drafting a bill, which will be just and fair to all ; or at least to call upon each one of the great metropolitan companies to send a delegate to advise upon the subject. Let this be done.

OUR SCIENTIFIC CONTEMPORARIES, ON THE GAS IMBROGLIO.

Our *confrere* of the *American Artisan* indulges in the following ululations :

"It is as easy for a gas company to make good carburetted hydrogen as it is for a baker to make good bread ; and if a good article is not given for a good price, the transaction is a deliberate and barefaced swindle in the one case as in the other."

* * * * * * * * *

"In some cases consumers of large quantities have supplemented the defects in the quality of the coal gas now supplied by the use of carburetters, by which the gas is charged with the vapor of benzole, naphtha, or equivalent hydrocarbon. Aside, however, from the inconvenience of this, it amounts only to supplying at their own cost what ought to be provided by the companies. For were the gas 15-candle power, as it should be, instead of 10, as it is, there would be no need of such adjuncts to increase the brilliancy of the flame. And it is to be remembered that 16-candle power is what the public pays for."

"These be parlous words." The howls of the secular press we do not much mind ; but when we have the like from one who teaches "as having authority, and not as the Scribes," it is high time to bestir ourselves. May we not urge some of our readers among the fraternity to assist us in stemming the tide of objurgation, which as in all such cases, is liable to swell beyond all reasonable bounds, if not resisted. "Silence is golden," as the transcendentalists say, but too much of it may kill the goose that lays the golden egg. We think it folly, altogether to shut our ears, and close our lips, and leave the enemy to his own devices. In the following further sentence, the *Artisan* sums up :

"The true way to reform is through thorough photometric tests of the gas furnished by the companies, and the mulcting of them in heavy penalties whenever the consumer gets less candle-power than he has bargained and paid for."

Next we turn to the *Scientific American*, and find a leader, which we have decided to transfer bodily to another column of this issue. We find the same, in substance, condensed into the *Journal of Applied Chemistry*. In this case we should be decidedly derelict in duty, did we not venture to point out one or two, at least, of the serious errors into which our esteemed contemporary has been betrayed. For example, he adopts the popular notion so often reiterated, that the producers of gas can "gouge" the consumers by "pumping in a quantity of atmospheric air." In the light of a little practical knowledge of gas, the utter fallacy of this supposition readily appears. Suppose a gas of 0·4 density has 25 per cent. of air mixed with it ; what will be the density of the mixture? Answer : 0·55. Now our contemporary himself says : "the more dilute (by which, as he says, he means the lower the density) the gas is, the more readily it will pass through a given aperture." The exact fact is that the flows through a given burner are as the square roots of the densities inversely. Therefore, a little calculation shows that under the same pressure, a burner which would discharge five feet of the above gas, could discharge but four and one-quarter feet of the mixture, or only 85 per cent. of the former flow.; that is the consumer would use only 85 per cent. as much as of the pure gas. But, it may be rejoined, that the Company will put on more pressure. To this the reply is that their pressure is regulated with the utmost exactness, according to an unvarying schedule applying to every hour in the day and night, and every day in the year, and moreover, a sufficient increase of pressure to compensate the above and bring the flow up to five feet again, would so derange their whole system of supply as to lead to utter confusion.

As to the coal used in New York yielding only from "six to seven thousand cubic feet" of gas per ton, this is also a mistake. It would pay no gas company here to use any such poor coal, or in fact any coal yielding less than nine or ten thousand feet.

We have no room for more, and add only that we hope these gentlemen will preserve the *juste milieu* in this business. The public may be fully righted, as we believe, without wronging the companies. *Fiat justitia*. Let us have fair play.

Gas Screens.

The attention of gas companies is directed to an advertisement of the American Gas Screen Manufacturing Company, on this page. Their screen is said to possess many points of excellence and superiority over all other screens now in use. From the list of gas companies who are at present using them, it shows they have proved satisfactory on all points. Gas companies can be supplied by addressing "American Gas Screen Company," Haverhill, Mass.

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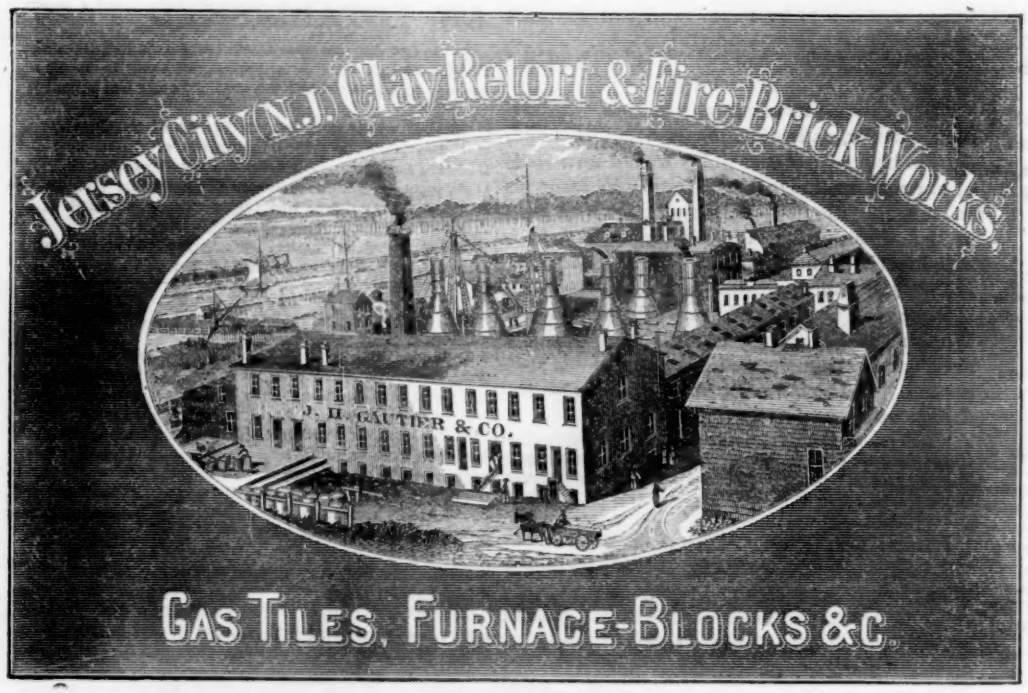

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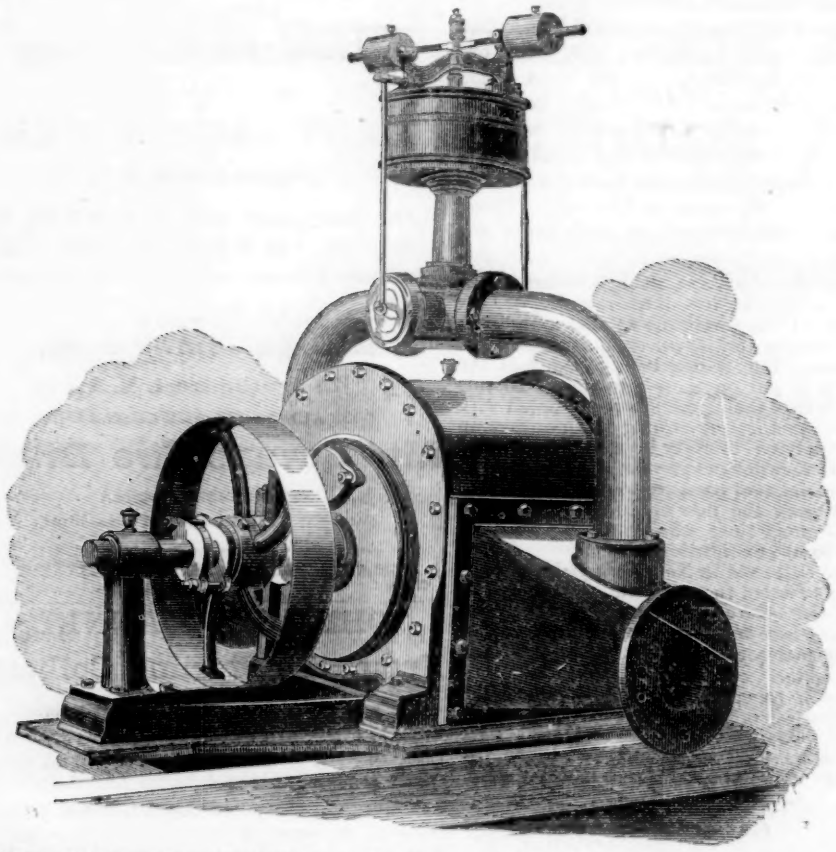

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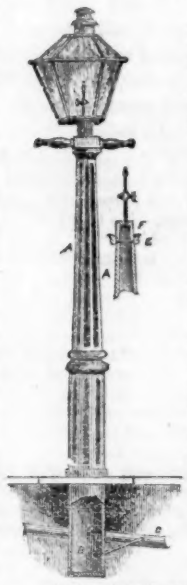

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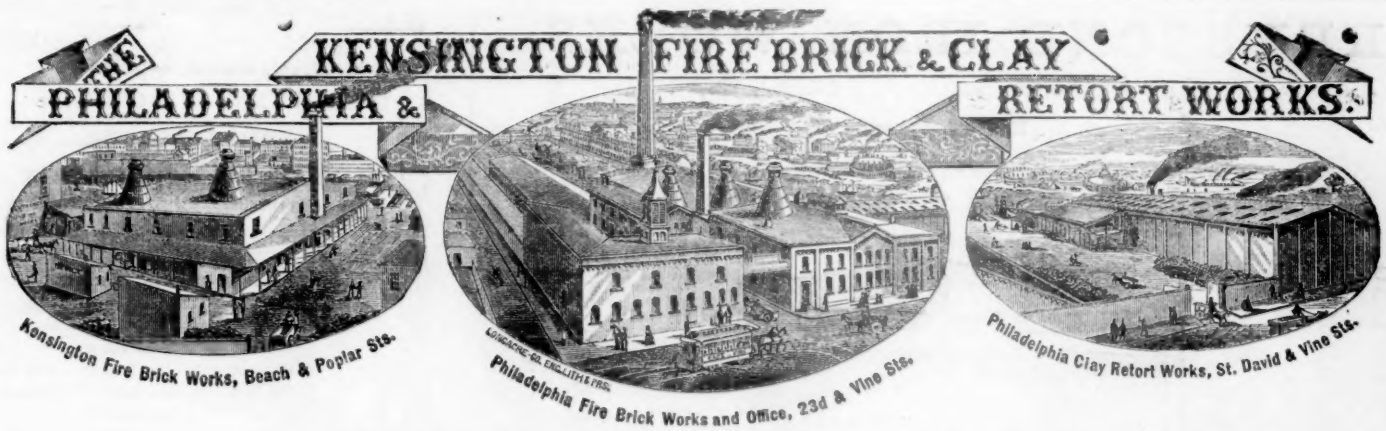
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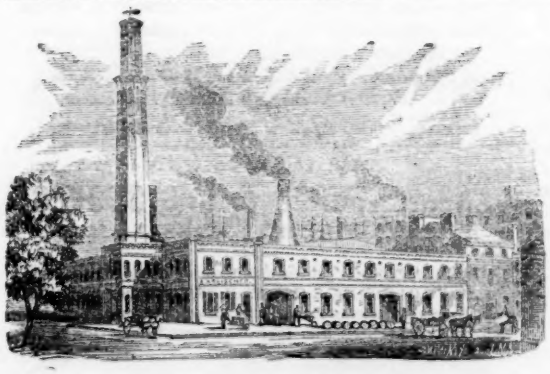

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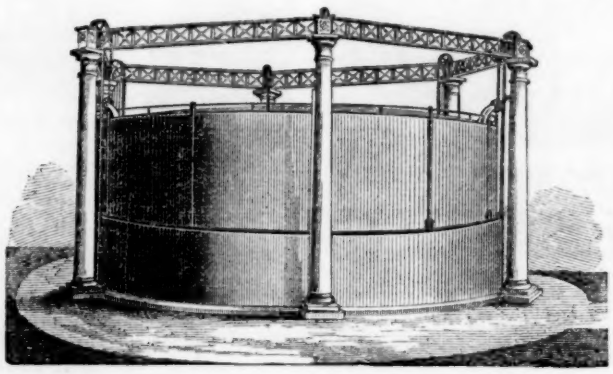

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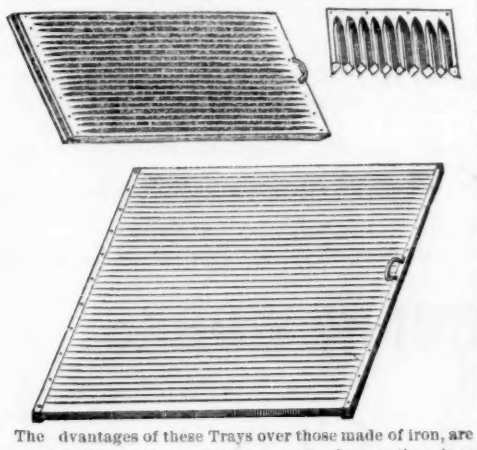

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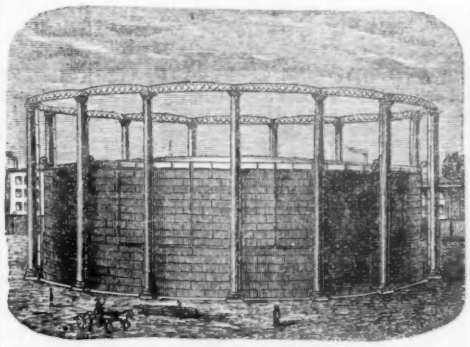

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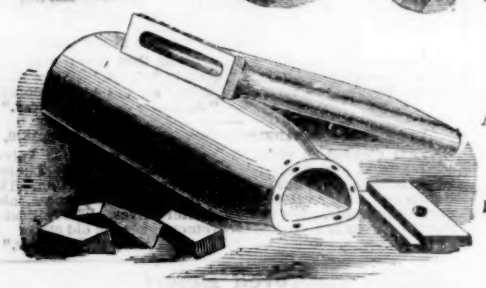

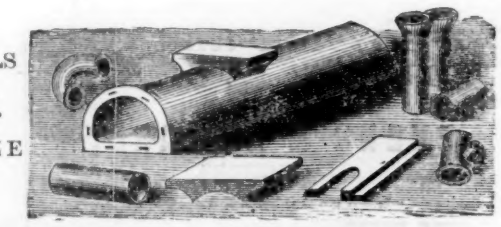

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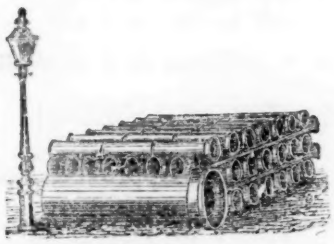

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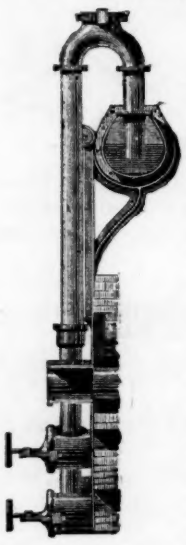

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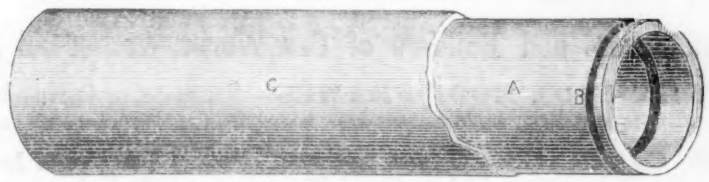

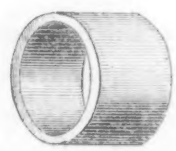

FIG. 2.

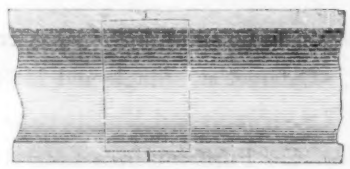

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3.—Horizontal Section and Connection.

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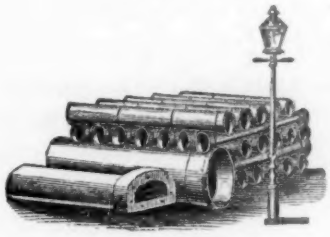

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